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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TETSUNORI KAJI, SHINICHI TACHI,
TORU OTSUBO, KATSUYA WATANABE,
KATSUHIKO MITANI, and JUNICHI TANAKA

Appeal No. 2009-008942
Application 10/052,538
Technology Center 1700

Before CHUNG K. PAK, TERRY J. OWENS, and JEFFREY T. SMITH,
Administrative Patent Judges.

PAK, *Administrative Patent Judge.*

DECISION ON APPEAL¹

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 87 through 92.² Claims 75 through 86 and 93 through 98, the other claims pending in the above-identified application, stand

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the "MAIL DATE" (paper delivery mode) or the "NOTIFICATION DATE" (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

² See page 2 of the Appeal Brief ("App Br.") filed May 16, 2008 and page 1 of Response to Notice of Non-Compliant Appeal Brief filed July 23, 2008.

withdrawn from consideration by the Examiner as being directed to a non-elected invention.³ We have jurisdiction under 35 U.S.C. §§ 6 and 134.

STATEMENT OF THE CASE

The subject matter on appeal is directed to a plasma etching apparatus which is said to be useful for “performing precise manufacturing of a fine pattern on a large sized sample” via producing “a large-sized and uniform plasma in which dissociation of the processing gas does not excessively progress” (Spec. 10, ll. 12-18). Details of the appealed subject matter are recited in claim 87 reproduced from the Claims Appendix to the Appeal Brief as shown below:

87. A plasma etching apparatus comprising a vacuum processing chamber and a pair of electrodes opposite to each other that are disposed in said vacuum processing chamber, one of said electrodes being used also as a sample table capable of holding a sample having a diameter of 300 mm or more containing an insulator film, wherein said plasma etching apparatus further comprises:

a gas introducing means for introducing an etching gas containing at least fluorine and carbon into said vacuum processing chamber;

a magnetic field forming means, including a pair of coils, for forming a magnetic field designed to generate increased plasma density at a portion within an outer periphery of said sample which is greater than the plasma density at the center of said sample by arranging the pair of coils so that the magnetic flux created by one of the coils cancels the magnetic flux of the other of the coils at the center of the sample and superposes on the magnetic flux of the other of the coils at the portion within the outer periphery of the sample,

means for etching a fine pattern on said sample by applying a high-frequency electric power of between only 30 MHz and 300 MHz between said pair of electrodes, and for setting the gap between said pair of electrodes of between only 30 mm and 100 mm, and for setting an atmospheric pressure

³ *Id.*

inside said vacuum processing chamber of between only 0.4 Pa and 4.0 Pa, and for setting the magnetic field value only to a value smaller than 30 gauss, in order to maintain a plasma density within a range of between $5 \times 10^{10} \text{ cm}^{-3}$ and $5 \times 10^{11} \text{ cm}^{-3}$ between said pair of electrodes to etch a fine pattern on said sample; and

a bias electric power source connected to one of said electrodes to control energy of ions in said plasma.

As evidence of unpatentability of the claimed subject matter, the Examiner relies upon the following evidence⁴:

Mintz	5,223,457	Jun. 29, 1993
Ohmi	5,272, 417	Dec. 21, 1993
Collins	5,300,460	Apr. 5, 1994
Heinrich	5,527,394	Jun. 18, 1996
Lenz	5,609,720	Mar. 11, 1997
Koshiishi	5,919,332	Jul. 6, 1999

Appellants request review of the following grounds of rejections set forth in the Answer:

1. Claim 92 under 35 U.S.C. § 112, first paragraph, as failing to provide written descriptive support in the application disclosure as originally filed for the presently claimed invention;
2. Claims 87 through 92 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Collins, Ohmi, Lenz, Heinrich, and Mintz;
3. Claims 87 through 92 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Ohmi, Collins, Lenz, Heinrich, and Mintz; and

⁴ See page 5 of the Answer (“Ans.”) dated November 12, 2008

4. Claims 87 through 92 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Koshiishi, Lenz, Collins, Heinrich, and Mintz. (*See* App. Br. 11 and Ans. 4.)

ISSUES AND CONCLUSIONS

With respect to the first ground of rejection, the dispositive question is: Have Appellants identified reversible error in the Examiner's finding that the Specification as originally filed reasonably conveys to one of ordinary skill in the art that the inventors, at the time the above-identified application was filed, had possession of the claimed subject matter relating to etching "a fine pattern of 0.2 μm or smaller" on the sample within the meaning of 35 U.S.C. 112, first paragraph? On this record, we answer this question in the affirmative.

With respect to the remaining three grounds of rejection, the dispositive question is: Have Appellants identified reversible error in the Examiner's finding that the applied prior art references teach or would have suggested the structure corresponding or equivalent to the claimed magnetic field forming means and the structures corresponding or equivalent to the claimed "means for etching a fine pattern...and for setting the magnetic density field value only to a value smaller than 30 gauss, in order to maintain a plasma density within a range of between $5 \times 10^{10} \text{ cm}^{-3}$ and $5 \times 10^{11} \text{ cm}^{-3}$ between said pair of electrodes to etch a fine pattern" or their equivalents within the meaning of 35 U.S.C. § 103(a)? On this record, we answer this question in the negative.

ANALYSIS, FINDINGS OF FACT, AND PRINCIPLES OF LAW

I. 35 U.S.C. § 112, First Paragraph:

As our reviewing court stated in *In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983):

The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, *rather than the presence or absence of literal support in the specification for the claim language....* The content of the drawings may also be considered in determining compliance with the written description requirement. [Citations omitted and emphasis added.]

Compliance with § 112, first paragraph, written description requirement, is a question of fact and is determined on a case-by-case basis, with consideration of the original disclosure as a whole. *Vas-Cath*, 935 F.2d at 1563; *In re Wright*, 866 F.2d 422, 425 (Fed. Cir. 1989).

Here, having applied the above test to the present factual situation, we concur with Appellants that the original disclosure as a whole reasonably conveys to one of ordinary skill in the art that the inventors had possession of a fine pattern of “0.2 μm or smaller” recited in claim 92 at the time the instant application was filed. As correctly pointed out by Appellants at page 12 of the Appeal Brief, the Specification, in the background of the invention, states the problem associated with producing a uniform plasma density over the surface of a sample having a diameter of 300 mm or more, which causes difficulty in manufacturing a “fine pattern of 0.2 μm or smaller on a wafer having a diameter larger than 300mm” (Spec. 6). Following the discussion of this problem, the Specification, at page 10, states that:

An object of the present invention is to provide a plasma processing apparatus and a plasma processing method capable of easily performing precise manufacturing of *a fine pattern* on a large sized *sample having a diameter of 300 mm or more* by

obtaining a large-sized and uniform plasma... [Emphasis added.]

Thus, it can be inferred from the Specification as a whole that the fine pattern referred to at page 10 of the Specification is a fine pattern of 0.2 μm or smaller referred to at page 6 of the Specification. Hence, Appellants have correctly identified harmful error in the Examiner's finding that the Specification, as originally filled, does not reasonably convey that the inventors had possession of a fine pattern of "0.2 μm or smaller" recited in claim 92 at the time the instant application was filed.

Accordingly, we reverse the Examiner's decision rejecting claim 92 under 35 U.S.C. § 112, first paragraph as lacking written descriptive support for the invention presently claimed.

II. 35 U.S.C. § 103(a):

Appellants do not dispute the Examiner's finding that:

Collins et al. discloses a plasma processing apparatus comprising: a vacuum processing chamber (col. 7, lines 10-20), a pair of electrodes opposite to each other that are disposed in the vacuum processing chamber, one of the electrodes being used also as a sample table capable of holding a sample having a diameter of 127 mm containing an insulator (col. 7, lines 10-20, col. 8, line 44, col. 9, line 45), a gas introducing means capable of introducing a fluorine-containing etching gas into the vacuum processing chamber (col. 8, line 64, col. 9, line 15), a means for applying a high-frequency electric power of 50-600 MHz (col. 8, lines 28-34) between the pair of electrodes whose gap is set to 50-300 mm (col. 8, lines 35-43) and for setting a pressure inside the vacuum chamber to 0.267-26.66 Pa (col. 53-57).

...

Ohmi discloses a plasma processing apparatus comprising: a vacuum processing chamber 105 (col. 6, lines 27-28), a pair of electrodes 102, 104 opposite to each other that are disposed in the vacuum processing chamber, one of the electrodes 104 being used also as a sample table capable of holding a sample having a diameter of 254 mm containing an insulator film (col. 6, lines 25-27, col. 12, lines 12-15, col. 15, lines 64-68), a gas introducing means capable of introducing a fluorine-containing etching gas into the vacuum processing chamber (col. 6, lines 30-31, col. 8, lines 65-66), means for applying a high frequency electric power of 100 MHz -250 MHz is applied between the pair of electrodes (col. 8, lines 23-27, col. 4, lines 31-33) whose gap is set to 30 mm (col. 8, line 24) and for setting a pressure inside the vacuum processing chamber to 0.933 Pa (col. 8, line 25), bias electric power source 110 connected to the one electrode 104 (col. 6, lines 62-68).

...

Koshiishi et al. discloses a plasma etching apparatus comprising a vacuum processing chamber 2 (Fig. 1) and a pair of electrodes 6, 21 opposite to each other that are disposed in the vacuum processing chamber (col. 9, lines 66-67), one of the electrodes being used also as a sample table 6 capable of holding a sample containing an insulator film (col. 11, line 40), wherein the plasma etching apparatus further comprises: a gas introducing means 23, 27 for introducing an etching gas containing at least fluorine and carbon into the vacuum processing chamber (col. 10, lines 17-24); means for generating a plasma with a density of $5 \times 10^{10} \text{ cm}^{-3}$ to $5 \times 10^{11} \text{ cm}^{-3}$ between the pair of electrodes to provide a substantially uniform plasma over the sample or more to etch a fine pattern on the sample (col. 13, lines 14-17); and a bias electric power source 44 connected to one of the electrodes to control energy of ions in the plasma (col. 11, lines 17-23). (Compare Ans. 6, 10, and 14 with App. Br. 14-26 and Reply Br. 2-4.)

Nor do Appellants dispute the Examiner's determination that "it would have been obvious to scale up the apparatus of Collins et al [or Ohmi] to process a wafer having a diameter of 300 mm since it is conventionally known in the art to process wafers having a diameter of 300 mm," obvious to operate the apparatus of Ohmi or Koshiishi in the manner mentioned by Collins, and "obvious to one of ordinary skill in the art to modify the magnetic forming means of Collins...[Ohmi, or Koshiishi] with the magnetic forming means...taught by Heinrich et al. in order to enhance process uniformity." (*Compare* Ans. 6, 7, 10-12, 15, and 16 *with* App. Br. 14-26 and Reply Br. 2-4.)

Rather, Appellants contend that the applied prior art references do not teach or suggest to the claimed magnetic field forming means and the claimed "means for etching a fine pattern...and for setting the magnetic density field value only to a value smaller than 30 gauss, in order to maintain a plasma density within a range of between $5 \times 10^{10} \text{ cm}^{-3}$ and $5 \times 10^{11} \text{ cm}^{-3}$ between said pair of electrodes to etch a fine pattern" including a fine pattern of 0.2 μm or smaller (App. Br. 14-26 and Reply Br. 2-4.) However, this contention is not well taken.

When apparatus claims recite means-plus-function limitations in accordance with 35 U.S.C. § 112, ¶ 6, such limitations are interpreted as the corresponding structures described in the Specification and equivalents thereof. *In re Donaldson Co.*, 16 F.3d 1189, 1193 (Fed. Cir. 1994) (*en banc*).⁵ Using the term "means" in claim limitations creates a presumption

⁵ Failure to describe the structures corresponding to the claimed apparatus means in the Specification, as originally filed, can be fatal in terms of the definiteness and enablement requirements of 35 U.S.C. § 112, second and

that the means-plus-function limitations are intended as required by 35 U.S.C. § 112, ¶ 6. *Personalized Media Communications, LLC v. ITC*, 161 F.3d 696, 703-04 nn. 9, 10 (Fed. Cir. 1998); *TriMed, Inc. v. Stryker Corp.*, 514 F.3d 1256, 1259 (Fed. Cir. 2008) (use of “means” in a claim limitation creates a presumption that 35 U.S.C. § 112, ¶ 6 applies).

Consistent with the requirement of 35 U.S.C. § 112, ¶ 6, the Examiner interpreted the claimed magnetic field forming means as electromagnetic coils 230 and 240 in the peripheral portion and the upper portion of the processing chamber 10 as illustrated in Figure 28. (*See* Ans. 19 and Spec. 62, ll. 5-15, which states that such positioning of electromagnetic coils 230 and 240 produces the claimed function.) The Examiner then found at pages 19 and 20 of the Answer, and Appellants do not dispute, that Heinrich’s Figure 2C illustrates electromagnetic coils (Sp) positioned in the peripheral and upper portions of a processing chamber. Thus, the Examiner has correctly found that Heinrich describes structures identical or equivalent to the corresponding structures to the claimed magnetic field forming means described in the Specification. Although not necessary, the Examiner also found at page 20 of the Answer that the electromagnetic coils (Sp) taught by

first paragraphs. *Atmel Corp. v. Information Storage Devices, Inc.*, 198 F.3d 1374, 1382 (Fed. Cir. 1999) (“[T]he corresponding structure(s) of a means-plus-function limitation must be disclosed in the written description in such a manner that one skilled in the art will know and understand what structure corresponds to the means limitation. Otherwise, one does not know what the claims means.”); *B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424 (Fed. Cir. 1997) (“Structure disclosed in the specification is ‘corresponding’ structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claims.”).

Heinrich are also capable of providing the claimed functions since they are arranged in the same manner illustrated in Figure 28 of the instant application, which according to page 62, lines 5 to 15, of the Specification, would provide the claimed functions.

Appellants do not show that Heinrich does not illustrate or describe structures identical or equivalent to the corresponding structures to the claimed magnetic field forming means described in the Specification. *See* App. Br. 14-26 and Reply Br. 2-4. Nor do Appellants show that the electromagnetic coils (Sp) taught by Heinrich do not possess the capability of providing the claimed functions. *Id.* Thus, on this record, we find no reversible error in the Examiner's finding that Heinrich describes structures identical or equivalent to the corresponding structures to the claimed magnetic field forming means described in the Specification.

The Examiner also interpreted the claimed "means for etching a fine pattern...and for setting the magnetic density field value only to a value smaller than 30 gauss, in order to maintain a plasma density within a range of between $5 \times 10^{10} \text{ cm}^{-3}$ and $5 \times 10^{11} \text{ cm}^{-3}$ between said pair of electrodes to etch a fine pattern" including a fine pattern of $0.2 \mu\text{m}$ or smaller, as corresponding to the high-frequency electric power source, electrode gap size, pressurizing means, and electromagnetic coils taught by Collins and Heinrich respectively (Ans. 21 and 22). The Examiner then refers to Mintz to explain that the apparatus structures suggested by the applied prior art references are capable of setting a magnetic field value of smaller than 30 gauss (Ans. 22).

Appellants do not question the Examiner's finding that Collins and Heinrich describe structures corresponding or equivalent to the claimed

“means for etching a fine pattern...and for setting the magnetic density field value only to a value smaller than 30 gauss, in order to maintain a plasma density within a range of between $5 \times 10^{10} \text{ cm}^{-3}$ and $5 \times 10^{11} \text{ cm}^{-3}$ between said pair of electrodes to etch a fine pattern” including a fine pattern of $0.2 \mu\text{m}$ or smaller described in the Specification. *See* App. Br. 14-26 and Reply Br. 2-4. Nor do Appellants show that the structures taught by Collins and Heinrich do not possess the capability of providing the claimed functions. Appellants’ reference to the specific operating conditions, including those recited in claims 88 through 91, within the operating conditions taught or suggested by Collins or Heinrich does not indicate that the claimed apparatus is patentably different than that suggested by the applied prior art references. *Id.* Thus, on this record, we find no reversible error in the Examiner’s finding that the structures taught by Collins and Heinrich correspond to the claimed means for etching a fine pattern, such as a fine pattern of $0.2 \mu\text{m}$ or smaller, and for setting particular magnetic conditions as required by claims 87 through 92.

Accordingly, for the reasons set forth in the Answer and above, we affirm the Examiner’s decision rejecting claims 87 through 92 under 35 U.S.C. § 103(a).

ORDER

In summary, we reverse the Examiner's decision rejecting claim 92 under 35 U.S.C. § 112, first paragraph, and affirm the Examiner's decision rejecting claims 87 through 92 under 35 U.S.C. § 103(a). Accordingly, the decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

AFFIRMED

sld

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